Production of *Buddleia davidii* and *Verbena Canadensis* in Clean Chip Residual

*C.R. Boyer[1], G.B. Fain[2], C.H. Gilliam[1], H.A. Torbert[3], T.V. Gallagher[4], and J.L. Sibley[1]

[1]Auburn University, Department of Horticulture, Auburn, AL 36849
[2]USDA-ARS Southern Horticultural Laboratory, Poplarville, MS 39470
[3]USDA-ARS National Soil Dynamics Laboratory, Auburn, AL 36832
[4]Auburn University, School of Forestry & Wildlife Sciences, Auburn, AL 36849
boyercr@auburn.edu

Index Words: pine bark, peat moss, substrate, CCR, container plant production, nursery crops

Significance to Industry: This study evaluated growth of *Buddleia davidii* 'Pink Delight' and *Verbena canadensis* 'Homestead Purple' in various substrates. Treatments included 100% pine bark (PB; from two sources, Alabama and Mississippi), 100% Clean Chip Residual (CCR) in two screen sizes (¾" and ½"), and mixtures of these materials on a 4:1 basis with peat moss. Few differences in plant growth were recorded indicating that CCR is a feasible alternative to pine bark for container-grown nursery crop production.

Nature of Work: A trend away from traditional forestry practices towards in-field harvesting of pine trees coupled with an increase in use of pine bark in other industries (2) is resulting in a decrease in the availability of pine bark or increased costs for nursery growers. Recent research has discovered a viable option in the forest residual product Clean Chip Residual, which is the material left behind when in-field harvesting of pine trees for "clean chips" occurs. A study by Boyer et al. (2) showed that annual bedding plants (*Ageratum* and *Salvia*) grown in CCR had similar growth to plants grown in traditional pine bark substrates. However, additional research is warranted to determine the most appropriate production methods and to further evaluate suitability of CCR for production of a number of additional species. The objective of this work was to evaluate CCR as a substrate for production of container-grown perennials.

CCR used in this study was obtained from a 10 year old pine plantation near Evergreen, AL. Loblolly pine (*Pinus taeda*) were thinned and processed for clean chips using a total tree harvester. CCR was further processed through a horizontal grinder with four inch screens. CCR was then run through a hammer mill to pass either a ¾ or ½ inch screen. These two CCR sizes were used alone or blended 4:1 (by vol) with peat and compared with to pine bark from suppliers in Mississippi and Alabama (Table 1). This study was initiated at the USDA-ARS Southern Horticultural Laboratory, Poplarville, MS on March 30, 2006. It was repeated at Auburn University, AL; however, due to space restrictions only the

MS data is presented. Each substrate was amended per yd^3 with 14 lb 18-6-12 (Polyon 9 month), 5 lb dolomitic limestone and 1.5 lb Micromax (Scotts Co.). Two perennial species, *Buddleia davidii* 'Pink Delight' and *Verbena canadensis* 'Homestead Purple', were transplanted from standard 72 cell flats and grown in trade gallon containers, placed outside in full sun and overhead irrigated as needed.

Results & Discussion: Results with *Buddleia* and *Verbena* were similar in that initial growth differences occurred among substrates (Table 1 and 2); however, these differences were minor and were likely due to varying irrigation needs among plants in the different substrates. By 64 days after planting (DAP) for *Buddleia* and 103 DAP for *Verbena* no growth differences were measured. The pine bark (AL)-peat (4:1) treatment had more flowers at the end of the study than most treatments which likely contributed to the larger shoot dry weight. Plants in treatments with the AL pine bark tended to exhibit excellent growth either alone or in combination with peat. In contrast, plants grown in the MS pine bark tended to have the least growth. These results with two different sources of pine bark indicate the variability in physical characteristics that often occurs among pine bark sources in the industry. Also, these results show that CCR can be used to grow plants as well as or better than some pine bark substrates currently used. All plants were commercially acceptable at the conclusion of the study.

Substrate pH measurements were within acceptable ranges (5.5 to 6.5) for the duration of the study. For EC all treatments at 15 DAP were above the recommended range (0.2 to 0.5 mS/cm). Only two substrates were within the recommended EC levels at 32 DAP: 4:1 pine bark: peat (both MS and AL). All other treatments at 32 DAP and all treatments at 63 DAP were below the recommended EC range. Shrinkage data showed slight differences in the height of the media surface (cm below the top of the pot) at 7 DAP (data not shown). However, at the conclusion of the study all treatments had the same substrate level indicating that use of CCR alone or in combination with peat does not significantly increase media settling due to decomposition of the wood.

Similarities among treatments in this study indicate that CCR is a viable substrate option for containerized plant production in nurseries. Plant growth among species in this test were similar compared to control plants, indicating that plant growth in CCR substrates are comparable to those grown in pine bark. Additional research to determine appropriate irrigation and fertilizer regimes as well as document the growth responses of other plant species grown in CCR is needed. Adoption of CCR as a substrate for nursery crop production could significantly increase substrate availability for nursery producers.

Literature Cited:

1. **Boyer, C.R., G.B. Fain, C.H. Gilliam, T.V. Gallagher, H.A. Torbert, and J.L. Sibley. 2006. Alternative substrates for bedding plants. Proc. Southern Nurs. Assoc. Res. Conf. 51:22-25.**
2. **Lu, W., J.L. Sibley, C.H. Gilliam, J.S. Bannon, andY. Zhang. 2006. Estimation of U.S. bark generation and implications for horticultural industries. J. Environ. Hort. 24:29-34.**

Table 1. Effects of various substrates on growth of *Buddleia davidii* 'Pink Delight'.

	Growth indices[z]			Flower number		Shoot dr.l: weight
Treatment'	32 DAP"	64 DAP	102DAP	64DAP	102DAP	105DAP
100%PB (MS)	19.0w c	61.2 a	66.4 a	7.1 a	9.1 cd	50.7b
100%PB (AL)	31.5 a	55.7 a	66.4 a	7.1 a	14.3 b	49.6 b
100%%" CCR	24.5 b	57.4 a	65.1 a	7.5 a	8.6 d	42.7 c
100% *'lz"* CCR	24.6 b	59.9 a	68.3 a	9.1 a	9.6 bed	42.6c
4:1 PB:PEAT (MS)	25.4 b	60.3 a	66.5 a	7.1 a	10.1 bed	49.3 b
4:1 PB:PEAT (AL)	31.3 a	55.2 a	68.9 a	6.1 a	18.8 a	58.1 a
4:1 %" CCR:PEAT	30.7 a	56.7 a	69.5 a	7.0 a	13.5 be	47.7 be
4:1 *'lz"* CCR:PEAT	26.8 b	63.0 a	67.4 a	7.4 a	10.3 bed	45.0 be

[z] Growth indices [(height+ widthl + width2)/3] presented in centimeters and shoot dry weight presented in grams.

[Y] Treatments were: PB = pine bark (MS = Mississippi source, AL =Alabama source), CCR = clean chip residual, PEAT = sphagnum peat moss.

[x] DAP = days after planting.

['"] Values within column followed by a different letter are significant using Duncan's Mu ltiple Range Test (u =0.05).

Table 2. Effects of various substrates on growth of *Verbena canadensis* 'Homestead Purple'.

	Growth indices[z]			Flowet·number		Shoot dry weight
Treatment'	32DAP"	64DAP	103DAP	64DAP	103DAP	lOSDAP
100%PB (MS)	18.4wc	50.7 a	83.6 a	15.1 c	20.3 be	67.5 a
100%PB (AL)	31.1 a	45.7 be	82.3 a	20.8 ab	19.5 be	70.8 a
100%%" CCR	24.0b	45.8 be	85.3 a	15.0 c	16.4 c	63.3 a
100% *'lz"* CCR	24.5 b	42.1 c	86.8 a	12.9 c	19.4 be	63.7a
4:1 PB:PEAT (MS)	21.5 be	48.0 ab	90.8 a	15.9 be	26.6 a	72.4a
4:1 PB:PEAT (AL)	33.2 a	46.3 abc	84.8 a	22.1 a	24.5 ab	74.2 a
4:1 %" CCR:PEAT	24.6b	46.6 abc	84.1 a	13.4 c	15.5 c	64.7a
4:1 *'lz"* CCR:PEAT	26.1 b	49.1 ab	86.8 a	12.5 c	16.9 c	64.8 a

[z] Growth indices [(height + widthl + width2)/3] presented in centimeters and shoot dJy weight presented in grams.

[Y] Treatments were: PB =pine bark (MS =Mississippi source, AL =Alabama source), CCR =clean chip residual, PEAT= sphagnum peat moss.

[x] DAP = days after planting.

['"] Values within column followed by a different letter are significant using Duncan's Multiple Range Test (u=0.05).